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BENJ. IDE WHEELER, PRESIDENT
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THE WOOLLY APHIS

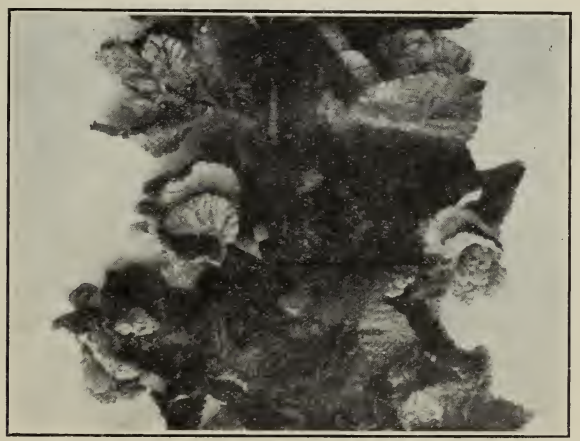
BY

C. W. WOODWORTH

The best known of the insects affecting the apple is called the woolly aphis because of the great amount of wax secreted by the aphid, making conspicuous white woolly masses on the under sides of the twigs, in patches on the trunk and larger branches, and even on the leaves or within the core of bell-flowers. The same insect occurs also on the roots but does not produce as abundant wax in this situation. The presence of the insect results in swellings, usually of small size and characteristic appearance.

LIFE HISTORY

Recent studies in the Maine Experiment Station have proven that the insect is only another form of the elm aphis, *Eriosoma ulmi*, and this becomes the technical name of the woolly aphis.



Curled leaves on elm produced by the woolly aphis.

On the Elm.—The history of the insect on the elm is, that in the fall a winged insect from some source previously unknown, arrives on the elm and gives birth to peculiar wingless lice of both sexes, incapable of feeding, which wander over the bark, the female entering a crevice and laying a single egg almost as large as herself. This egg hatches about the time the first leaves appear in the spring.

The louse hatched from the winter egg locates on the under side of a small leaf and proceeds to found a colony. It is only a few days before there are grand-daughters and great grand-daughters. In the meantime the leaf has begun to curl so as to produce a great pocket in which the colony continues to increase until there are thousands of individuals, all wingless females, producing living young. Finally, as the leaf matures, the young produced develop into winged insects that fly away and the older members of the colony die, so that before midsummer the large swollen leaves are without living inhabitants though they cling to the tree all summer and the following winter as well.

On the Apple.—We now know that these winged lice from the elm leaves return to the apple. The history of the insect in most parts of California is the development of wingless females in uninterrupted succession in both the roots and the twigs, both summer and winter, with now and then a certain proportion becoming winged and almost any time during the summer or fall the air may suddenly be filled with these migrating winged insects. Of course in these migrations by far the greater number of individuals fail to find a suitable place to locate and simple die. There is also to be noted at times, especially in the spring, definite wandering periods in the case of wingless individuals whereby the insects become scattered over the tree.

The time of greatest increase is in the spring when the tree is also growing vigorously, before midsummer the colonies loose vigor,—indeed generally fail to hold their own and decrease spontaneously, the trees becoming apparently free, perhaps only a few in some sheltered spot on the trunk, carrying the insect over to the next season. Similar changes in numbers are noticeable in the case of the insects on the roots and in the spring a definite migration of wingless insects from the roots to the twigs has been noticed. An egg laying form on the apple has been described as occurring in the fall, but the writer has not observed it at Berkeley nor in the Pajaro Valley.

ECONOMICS

The woolly aphis is almost universally present where apples are grown, but is of very unequal importance. As far as is known it

is native to Europe but is of small enough significance that the apple infesting form was not described for nearly a century after the elm form was made known. English entomologists believed that the insect was of American origin calling it "American Blight."

RESISTANT ROOTS

In Australia it is particularly serious and has been successfully combatted by the use of Northern Spy roots. These roots have proven equally effective in California and are certainly to be recommended wherever the wolly aphis is a serious pest. There is perhaps no part of the State where resistant roots are absolutely essential to the profitable growing of apples.

CONTROL IN THE NURSERY

The economic problem in the nursery is essentially different from that in the orchard, because horticultural inspectors generally insist on stock being entirely free from any sign of the presence of the aphid. Nursery stock grown where the aphid is not serious enough to prevent normal growth and intended for planting in similar localities is intrinsically as valuable when infested as when free, but, because many inspectors do not take this view, it is essential for nursery men to produce stock free from the insect when intended for general sale. This requires the prevention of wing production in the neighborhood of the nursery. When elm trees occur in the neighborhood they should be carefully inspected in the spring as soon as the swollen leaves become conspicuous and these leaves removed. Nearby apple trees should be kept free all summer from the twig infestation by the methods detailed below. There seems to be no danger of winged forms issuing from the roots.

Should the nursery become infested it is well to dig up and destroy everything that has been attacked as soon as discovered as the wingless forms may spread along nursery rows.

CONTROL IN THE ORCHARD

The great majority of orchardists in this State do not consider the woolly aphis injury serious enough to take any measures toward suppressing it. In some localities every year and elsewhere during some seasons, treatment is amply justifiable.

Oil Treatment.—The simplest, and in most cases, the cheapest treatment is the direct application of kerosene or gasolene by means of a brush or small cloth swab. Do not use too much oil for fear of making dead spots on the bark. If this method is employed one should begin early enough in the spring while the insect is in scattered

colonies. The work can be done as quickly as spraying and is immediately and completely effectual. The trees should be gone over about once a week during the spring till the danger of rapid increase is past.

Spraying is necessary if the insects have been allowed to become too numerous to be economically treated with oil. The best insecticide for aphids is nicotine. The following formula is effective:

Nicotine sulfate 40 per cent	1lb.
Cresol soap	1 gal.
Water	200 gal.

1–⅓ lbs. when using 30 per cent.

The manufacturers recommend the use of twice as much nicotine. The soap is added simply to increase the penetration. Whale oil soap may be substituted, but use ten times as much. There are several brands of tobacco extract, weaker than 40 per cent. If the weaker nicotine is used, substitute 1⅓ lbs. when using 30 per cent; 2 lbs. when using 20 per cent; 4 lbs. when using 10 per cent; 10 lbs. when using 4 per cent; 50 lbs. if the tobacco stems are used instead of the extract. In this case the stems should be steeped in warm water to extract the nicotine and then the soap added to this extract. Spraying must be very thoroughly done to give satisfactory results.

Sand Treatment.—It may sometimes be desirable to prevent the migration of the lice from the roots. Since the insects cannot burrow through the soil but must follow cracks and almost always migrate along the trunk of the tree, the easiest means of preventing their movements is to dig out a few shovels of earth and fill in the space with sand, which does not crack.